User's Manual

Logimac 330 PLC Based Triplex Pump Control Panel with Floats

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System general characteristics

LOGIMAC® 330 (P/N 13-50 90 71) is a control system with the programmable logic controller (PLC), which has been programmed especially for the operation and surveillance of stations containing three submersible ITT FLYGT pumps. A level control is based on 5 or 4 (maximum two pumps in simultaneous operation) float signals (level switches).

The control system accomplishes the following basic functions (without being limited to it):

- **allows a choice between three or two pumps in simultaneous operation**
- **controls the three pumps start - stop sequence**
- **alternates the duty pump 1, 2, 3 after each cycle of operation,**
- **detects and diagnoses fault conditions of the pumps and of the level sensors,**
- **puts into service the standby pump(s), if the duty pump is in fault,**
- **Identifies the degree of urgency between all fault-conditions and classifies them as FAULTS or EMERGENCY.**
- **With operator interface option : allows a choice to control of 2 different groups of pumps Normal & Jockey or Normal & Storm.**
- **With operator interface option : allows reading of all runtime totalizers & event counters and also parameter change (delays, # of pumps)**
- **With operator interface option : displays alarms & allows reading of logged alarm with date & time.**

1.1 Part numbers

Programmable logic controller LOGIMAC® 330-PLC : P/N 13-50 90 72
I/O expansion unit : P/N 13-40 02 29
Alarm annunciator LOGIMAC® 440-AP1----------: P/N 13-50 90 38
Alarm annunciator LOGIMAC® 440-AP2----------: P/N 13-50 90 39

Operator Interface LOGIMAC® 330-OP----------: (P/N 13-50 90 89) OPTION
Cable interface -PLC----------: (P/N 13-40 02 19) OPTION

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2. Detailed Specification

2.1 Logimac® 330-PLC Configuration & Technical Data

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ITEM #	DESCRIPTION	TECHNICAL DATA
P/N 13-50 90 72	CPU & Memory	Flash user memory program memory: 9 Kwords storage memory: 2 Kwords operation speed: 1.0 ms/ 1Kword of logic user program: L330JS
	16 - inputs	24V DC; current consumption: 7.3mA max./point
	11 relays+1 DC -outputs	operating.voltage: 5-30 V DC 5-250 V AC max. load: 2A resistive/ 0.6A ind.
	Supply	120V AC (102 -132V), 60 Hz (47- 63 Hz) DC output power supply: 24V + -10%, 200 mA max. current
	Dimensions	(90H x 150W x76D) mm
	service temperature stocking temperature	0..+55°C -40..+85°C
	Port	Two serial ports:1: RS 232, 2: RS 485
	Removable terminal strip	included
P/N 13-40 02 29	Expansion unit 8-nputs/6-outputs	Inputs: 24V DC; current consumption: 7.3mA max./point Relay output: operating.voltage: 5-30VDC 5-250 V AC max. load: 2A resistive/ 0.6A ind. Supply : 120V AC (102 -132V), 60 Hz (47- 63 Hz) DC output power supply: 24V + -10%, 200 mA max. current Dimensions: 90H x 95W x76D) mm

2.2 Assignation of Logimac® 330-PLC Inputs & Outputs

LOGIMAC® 330-PLC has 24 digital inputs and 18 digital outputs (17 relay-based and 1 DC) . For this application the inputs and outputs are assigned to the signals specified in the table 1 and 2 respectively.

TABLE 1.: INPUT ASSIGNATION

INPUT	DESCRIPTION	NOTES
1	ACKNOWLEDGE/ RESET	signal provided by push button RESET on the alarm annunciator
2	AUTO P1	contact indicating AUTO position of the mode selector of the P1 pump
3	AUTO P2	contact indicating AUTO position of the mode selector of the P2 pump
4	AUTO P3	contact indicating AUTO position of the mode selector of the P1 pump
5	B1	contact indicating overcurrent (breaker aux. contact) of the P1 pump,
6	R5,R6	contact indicating leakage or high temperature (interfacing relay contact from Mini CAS II unit) of the P1 pump
7	B2	contact indicating overcurrent (breaker aux. contact) of the P2 pump,
8	R7,R8	contact indicating leakage or high temperature (interfacing relay contact from Mini CAS II unit) of the P2 pump
9	FLH- NC (or ISRH)	contact indicating the high level reached (follows FLH float NC contact)
10	FLH- NO (or ISRH)	contact indicating the high level reached (follows FLH float NO contact)
11	FL4	contact indicating the START 3 level reached (follows FL4 float NO contact)
12	FL3	contact indicating the START 2 level reached (follows FL3 float NO contact)
13	FL2	contact indicating the START 1 level reached (follows FL2 float NO contact)
14	FL1	contact indicating the STOP level reached (follows FL1 float NO contact)
15	M1 contactor closed	auxiliary contact of the M1 contactor to indicate the contactor status
16	M2 contactor closed	auxiliary contact of the M2 contactor to indicate the contactor status
17	M3 contactor closed	auxiliary contact of the M3 contactor to indicate the contactor status
18	B3	contact indicating overcurrent (breaker aux. contact) of the P3 pump,
19	R9,R10	contact indicating leakage or high temperature (interfacing relay contact from Mini CAS II unit) of the P3 pump
20	PFD	power failure detection (PFD)
21	FLL (or ISRL) option	contact indicating the low level reached (follows FLL float NC contact)
22	FLOV	Contact indicating overflow (FLOV float)
23	jumper or GEN SET RUN contact	to limit the parallel operation to 2 pumps;
24	not used	

For wiring details see drawing L330I/O: LOGIMAC 330 I/O CONNECTION

TABLE 2.: OUTPUT ASSIGNATION

OUTPUT	DESCRIPTION	NOTES
1	High Level alarm (option 3)	The output of 24V DC, 0.75 A max. load, programmed as a memorised High Level alarm. Use a separate LED for indication.
2	M1 closing signal	order to close the M1 contactor (interface relay R1)
3	M2 closing signal	order to close the M2 contactor (interface relay R2)
4	M3 closing signal	order to close the M3 contactor (interface relay R3)
5	**EMERGENCY** alarm	**EMERGENCY** alarm signal for remote transmission (interface relay R14)
6	**EMERGENCY/FAULT**	**EMERGENCY** signal (flashing) and FAULT signal (stable) to alarm annunciator
7	P1 overcurrent	P1 overcurrent alarm signal to alarm annunciator (this output is activated also if M1 contactor does not close its contact during nine(9) seconds following the order to close - R1 relay contact closing)
8	L1/T1	P1 Leakage or High Temperature alarm to annunciator
9	P2 overcurrent	P2 overcurrent alarm signal to alarm annunciator (this output is activated also if M2 contactor does not close its contact during nine(9) seconds following the order to close – R3 relay contact closing)
10	L2/T2	P2 Leakage or High Temperature alarm to annunciator
11	FL1 FAILURE	FL1 float FAILURE signal
12	FL2 FAILURE	FL2 float FAILURE signal
17	Low Level alarm (option 2)	programmed as a memorised Low Level alarm (optional)
18	P3 overcurrent	P3 overcurrent alarm signal to alarm annunciator (this output is activated also if M3 contactor does not close its contact during nine(9) seconds following the order to close – R3 relay contact closing)
19	L3/T3	P2 Leakage or High Temperature alarm to annunciator
20	FL3 FAILURE	FL3 float FAILURE signal
21	FL4 FAILURE	FL4 float FAILURE signal
22	FLH FAILURE	FLH float FAILURE signal

For wiring details see drawing L330 I/O: LOGIMAC 330 I/O CONNECTION

2.3 Program Description

2.3.1 FLOAT FAILURE DETECTION

Programmable controller (PLC) assumes a continuous surveillance of the operating capabilities of all floats and their electrical wiring.
Float failure detection is done during increasing and decreasing water level.
With a raising water level, the floats' NO (normally open) contact must close in sequence: FL1-FL2-FL3-FL4-FLH. If a lower float does not close its contact (contact **fails to close**) before the higher float, the lower float will be declared faulty.
With a water going down, the floats must open in sequence: FLH-FL4-FL3-FL2-FL1. If a lower float opens its NO contact before a higher float, the higher float (or floats) will be declared faulty (its contact **fails to open**).
The float failure fault can not be acknowledged or reset using the RESET push button of the alarm annunciator.
To clear the float failure fault, the float contact must close, if it failed to close, or open, if it failed to open.
A level sensor failure is indicated on the alarm annunciator by one of LED's diodes labelled as "**FL1 FAILURE", "FL2 FAILURE", "FL3 FAILURE","FL4 FAILURE","FLH FAILURE"** respectively

2.3.2. FLOAT ASSIGNATION

Five (or four) specific levels are assigned to floats FL1, FL2, FL3, FL4, FLH during each scan of program:

- STOP level
- START 1 level
- START 2 level
- START 3 level
- HIGH LEVEL alarm

Under normal circumstances (no float failure) the floats are assigned as follow:

- FL1 - STOP level (stops two pumps)
- FL2 - START 1 level (starts the duty pump)
- FL3 - START 2 level (starts the standby pump)
- FL4 - START 3 level (starts the second standby pump)
- FLH - water HIGH LEVEL alarm

If FL1 float fails with 5 floats sequence, the operating floats will be assigned as follows:

- FL1 - failure alarm(out of order)
- FL2 - STOP level (stops two pumps)
- FL3 - START 1 level (starts the duty pump)
- FL4 - START 2 level (starts the standby pump)
- FLH - START 3 level (starts the second standby pump) and gives water HIGH LEVEL alarm

NOTE: See table 1&2 in appendices 1 for floats assignation in each specific case of the float failure.

2.3.3. MODE OF OPERATION

A three-position MAN-OFF-AUTO operation mode selector is provided for each pump.
The AUTO position provides a completely automatic system operation.

If mode selector is placed in MAN position the respective pump will start without delay independently from level detector conditions and requirements.
To stop this pump , put the mode selector in OFF position.
Either during manual or automatic operation the pumps stop automatically on fault condition.

2.3.4 CHOICE OF PUMP TO START

The control system allows the operation of up to three pumps in parallel but prevents simultaneous start of two or more pumps.
The **number of pumps** allowed to operate simultaneously (**in parallel**) can be limited if an input 23 is activated.

In manual mode the pump with its mode selector placed in MAN position will start.

In automatic mode a choice of the pump to start is done by PLC program following the conditions specified below:

With all pumps available to operate simultaneously:

	start 1 (FL2)	**start 2 (FL3)**	**start 3 (FL4)**
SEQUENCE 1	pump 1	pump 2	pump 3
SEQUENCE 2	pump 2	pump 3	pump 1
SEQUENCE 3	pump 3	pump 1	pump 2

With a limit to 2 of pumps available for simultaneous operation:

	start 1 (FL2)	**start 2 (FL3)**
SEQUENCE 1	pump 1	pump 2
SEQUENCE 2	pump 2	pump 3
SEQUENCE 3	pump 3	pump 1

In automatic mode the choice of the pump start sequence is done automatically following the previous cycle of operation memorized conditions.

If no sequence is memorized or if no alternate mode is chosen the pumps will start following the SEQUENCE 1.

On the event of the pump failure, the pump next in sequence, will receive the order to start with respect to level conditions and the number of pumps allowed in parallel operation.

To start the pump, the corresponding START float should be active (its NO contact should be closed) at least during a **10-second** period calling ***START DELAY.*** The default value is 10 seconds.
If one of the pumps is stopped (for whatever reason) the ***BLOCKING DELAY*** will be activated. None of the pumps can start during this period (all pumps will be prevented to start). If more pumps are running and one of them stops, this delay will not have any effect on the running pumps.
The default value of the ***BLOCKING DELAY*** are 15
Either start conditions or parallel conditions should be kept during at least **10-second** period (***START DELAY***) to start the pump.

2.3.5. CONTACTOR OPERATION

In automatic mode the M1 contactor of the P1 pump (or the M2 contactor of the P2 pump) will close following the closing signal from R1 (or R2) interface relay after ***START DELAY*** as specified in previous section.
Reception of closing confirmation by PLC is indicated by turning on the respective diode LED labelled **RUN P1**, **RUN P2** or **RUN P3** on alarm annunciators (see appendices 2 for annunciator details).

NOTE: ***Closing fault***: If PLC does not receive a confirmation of the closing (see M1, M2 or M3 contact on PLC inputs I15, I16, I17) during a 9-second period following the closing order (R1, R2 or R3 relay closing contact), the closing signal will be removed and alarm will be signalled. The LED diode EMERGENCY/**FAULT** on the alarm annunciator will turn on.

Each contactor can be opened or closed **manually,** using a mode selector (**MAN-OFF** positions).

Either during manual or automatic operation the contactor opens automatically on fault condition of the respective pump.

2.3.6. ALARMS

2.3.6.1 P1 / P2 / P3 PUMP OVERLOAD or M1/M2/M3 CONTACTOR CLOSING FAULT

On the overload fault, the respective pump breaker opens. Auxiliary contacts of breakers are used as the overload signal for PLC inputs (B1, B2, B3).
If one of contacts is closed , the corresponding contactor closing signal will be removed (see R1, R2, R3 relay) and the OVERLOAD alarm will be memorized in PLC memory and be indicated by the flashing LED diode (**OVERLOAD P1** , **OVERLOAD P2, OVERLOAD P3)** on the alarm annunciator.

The same LED diode can turn on also in the case of ***Closing fault*** of the corresponding contactor (see NOTE in previous chapter
This alarm will be held, even if the fault conditions disappear. The contactor of the pump in fault will open automatically and cannot be closed without an operator's intervention.

Reset the circuit after the fault correction: push the RESET push-button once for **acknowledge** (LED stops flashing), and twice for **reset** .

2.3.6.2 .ALARM: WATER LEAKAGE OF P1 / P2 / P3 PUMP

The faults detection will be done by the sensors attached to Mini CAS II units of ITT Flygt. The interface relay of this unit (**R6**, **R8, R10**) operates if water is detected in the corresponding pump (P1, P2, P3). The contact of this relay is connected to PLC input to provide the information .

If one of these contacts is closed, the corresponding contactor closing signal will be removed
(see R1, R2, R3 relay) and the alarm WATER LEAKAGE will be memorized in PLC memory and be indicated by the flashing LED diode (**LEAK. P1**, **LEAK. P2, LEAK. P3**) on the alarm annunciator.

This alarm indication will be held, even if the fault conditions disappear. The contactor of the pump in fault will open automatically but can be closed if the fault conditions disappear.

Reset the circuit after the fault correction: push the RESET push-button once for **acknowledge** (LED stops flashing), and twice for **reset** .

2.3.6.3 ALARM: HIGH TEMPERATURE OF P1 / P2 / P3 PUMP

The faults detection will be done by the sensors attached to Mini CAS II units of Flygt. The interface relay of this unit (**R5**, **R7, R9**) operates if the temperature of pump goes higher than sensor adjustment in the corresponding pump. The contact of this relay is connected to PLC input to supply the information .

If one of these contacts is closed, the corresponding contactor closing signal will be removed (see R1, R2, R3 relay) and the alarm HIGH TEMPERATURE will be memorized in PLC memory and will be indicated by flashing LED diode (**TEMP P1, TEMP P2, TEMP P3**) on the alarm annunciator.

This alarm will be held, even if the fault conditions disappear. The contactor of the pump in fault will open automatically and cannot be closed without an operator's intervention.

Reset the circuit after the fault correction: push the RESET Mini Cas push-button first and after RESET on the alarm annunciator once for **acknowledge** (LED stops flashing), and twice for **reset** .

2.3.6.4. ALARM: HIGH WATER LEVEL

The fault detection will be done by FLH float. The normally open contact (NO) of the ISRH interface relay is connected to the PLC input.

If this contact is closed, a HIGH WATER LEVEL alarm will be memorized in the PLC memory and will be indicated by LED diode (**HIGH LEVEL**) on the alarm annunciator.

The R14 relay will operate (its NO contact is available for transmission of **ALARM** signal remotely).
This alarm will be registered but indication on the annunciator will stay only the conditions are present.
If fault conditions disappear LED HIGH LEVEL turns off.

2.3.6.5. ALARM: Memorised HIGH WATER LEVEL (option 3)

If the red light (HIGH LEVEL) is connected to the 24VDC output **Q1** of the LOGIMAC 330-PLC the HIGH WATER LEVEL alarm be indicated by this red light on the control panel.
This alarm indication will be hold even if the fault conditions disappear.

Reset the circuit after fault correction: push the RESET push button on the alarm annunciator once for **acknowledge** (stop flashing) and twice for **reset.**

2.3.6.6. ALARM: LOW WATER LEVEL (OPTION)

The faults detection can be done by FL1A float connected to LOGIMAC 440-PLC directly or by interposing intrinsically safe relay (ISRLL).

If this input is energized, a LOW water LEVEL alarm will be memorized in PLC memory and will be indicated by the flashing LED diode (**LOW LEVEL**) on the alarm annunciator.

This alarm will be registered and indicated on the annunciator even if fault conditions disappear.

Reset the circuit after the fault correction: push the RESET push-button once for **acknowledge** (LED stops flashing), and twice for **reset** .

2.3.6.7. ALARM: POWER FAILURE

The faults detection will be done by the power failure detector (PFD) connected to three phases of the power entrance. The PFD operates on phase or power failure. Its NC contact is opened if three phases are present and voltage value is between adjusted limits. On fault this contact will close.

If this contact is closed, the contactor closing signals will be removed (see R1, R2, R3, R4 relay) and the alarm POWER FAILURE will be memorized in PLC memory and will be indicated by the LED diode (**POWER FAILURE**) on the alarm annunciator.

This alarm will be registered but will be indicated on the annunciator only if fault conditions still exist. The contactors will open automatically but can be closed following start sequence if power is back to normal.

2.3.6.8. ALARM: FL1/FL2/FL3/FL4/FLH FLOAT FAILURE

LOGIMAC 330 programming requires that the floats close and open their contacts in defined order:

- **with increasing level** all floats should close their contacts in sequence: FL1-FL2-FL3-FL4-FLH. If any of these floats doesn't follow this sequence (for example : FL1 contact does not close but the one of FL2 float does), the floats out of sequence will be declared failed (FL1 will be declared failed). The failed float will be "removed " from pump control sequence and its function will be assigned to the float, which follows failed float in sequence. (see tables at the end of this manual for detailed float's function assignation).

If a failed float's contact closes, the alarm will be cleared and this float will take back its function in the pump control.

- **with decreasing level** all floats should open their contacts in sequence: FLH-FL4-FL3-FL2-FL1. If any of these floats doesn't follow this sequence (for example : FL3 contact does not open but the one of FL2 float does), the floats out of sequence will be declared failed (FL3 will be declared failed). The failed float will be "removed " from pump control sequence and its function will be assigned to the float, which follows failed float in sequence. (See table at the end of this manual for detailed float's function assignation).

If a failed float's contact opens, the alarm will be cleared and this float will take back its function in the pump control.
The failed float will be indicated on the alarm annunciator.

2.3.7 EMERGENCY/FAULT SIGNAL

An **EMERGENCY** condition exists if :

- High level sensor (float **FLH**) is activated or is faulty; or ,
- Three pumps have experienced at least one fault each or,
- Four (three for four- float sequence)or more floats failed
- Power phase failure is detected

In an **EMERGENCY** condition alarm :

- Flashing LED diode **EMERGENCY**/FAULT is lit on the alarm annunciator ;
- **R14** relay is activated (its NO contact is available for transmission of **EMERGENCY** signal remotely).

Any fault condition other than an EMERGENCY condition is considered as **FAULT** and will be indicated by:

- Turning on a corresponding alarm LED diode on the alarm annunciator, and
- turning on LED diode EMERGENCY/**FAULT** stable (**no flashing**)

NOTE: If **FAULT** signal is required for remote indication, connect an auxiliary relay R15 (24V DC.) to EMERGENCY/**FAULT** PLC output Q6 in series with normally closed contact (NC) of R14 relay. Use a contact of this relay as FAULT signal (see drawing L330 I/O for details)

2.4 Alarm Annunciators Logimac® 440-AP1 and Logimac® 440-AP2

2.4.1 TECHNICAL DATA :

Supply voltage: 24V DC
Current consuming: 80 mA.

2.4.2 COMPONENTS and THEIR FUNCTIONS:
Each annunciator is composed of four (4) integrated parts:

- Printed circuit board (P/N 13-50 90 07)
- Face plate with descriptions (P/N 13-51 15 44 or P/N 13-51 15 45)
- Board connector with terminal (P/N13-42 00 03)
- Flat cable (P/N 13-41 00 15)

The printed circuit board represents the circuit as per drawing 2603-A2 (see appendices 2). The circuit contains:

- 13 diodes LED (D1..D13),
- 2 push buttons (SW1et SW2),
- 13 resistors (R1..R13) to limit the current and
- 26 auxiliary diodes of type 1N4004 (D14.. 39).

Each parallel circuit (total 16 circuits) is connected to one pin (1-16) of the (P1) plug for the flat cable .

The functions of circuit are :

Indication:

The positive (+) signal of 24V DC power supply connected to terminal 2 is common for all diodes LED. To turn on the diode LED, the negative (-) signal should be connected to another end of circuit. It can be done if the PLC output relay contact, connected to the specific LED circuit closes ***(All PLC outputs connected to annunciator should have the common terminal COM connected to negative(-) terminal of source).***

Lamp test:
The negative (-) signal of 24V DC power supply connected to terminal 1 is used to test LED diodes. Pushing the push button SW1, connects 24V DC power supply to all LED diode circuits and turn all LED's on.

Acknowledge/Reset:

By pressing the push button SW2, the positive(+) signal of 24V DC power supply will be connected to PLC input being connected to terminal 4 of the annunciator.
This input signal is programmed in PLC as *acknowledge* signal (first appearance) and as *reset* signal (second appearance).
It is important to connect the common terminal COM of this PLC input to negative (-) terminal of source.
Face plate is a two-side lamicoid plate with descriptions in English on one side, and in French on the another. The descriptions are as per drawing C-51 15 44 or C-51 15 45
(see appendices 2).
Board connector with terminal is composed of 16 screw-terminals connected to a 16-pin male plug (P2) for flat cable .
The flat cable is a 2-meter length flat cable with one female-plug on each end, which can be plugged in:

- the P1 plug (on printed circuit board) and
- the P2 plug (on board connector with terminals).

3. Option: Operator Interface

3.1 Description

The operator interface LOGIMAC® 330-OP is a fully programmable man-machine interface.
One part of a programming can be done using the software, specific for the unit, and another one should be programmed in the PLC program software for PLC ladder programming.

The operator interface is equipped of:

- 6 programmable function-key
- Alpha-numeric key-pad
- LCD screen 160x32 pixels (89.6x17.9mm display) for small graphic/80 total characters on 4 lines
- PLC communication port RS 232
- RS422/RS485 serial programming port
- cable: operator interface-PLC (DB9F- RG45)
- The supply voltage 24VDC
- Power consumption: Normal 0.1A @ 24VDC, Max 0.3A

Logimac 330-OP

The operator interface was fully programmed for this application (see description of this programming in chapter 5 of this manual).

For further details, please refer to the manufacturer user manual supplied with unit.

3.2 Pump Group Choice

The control system allows the operation of up to three pumps in parallel (operator choice) but prevents simultaneous start of two or more pumps.

The pumps operation depends on pump groups setting.
Maximum 2 different groups (from 3 available) can be chosen: group **N**-Normal, group **J**-Jockey, group **S**- Storm

N - Normal (minimum 2) these pumps will work in normal and high level condition. They can work together if the number of pumps in **P**arallel is set > 1.

J - Jockey: if **J=1**, **P1** will be called a jockey–pump. Usually this pump will be smaller than **N**ormal pumps. This pump will always start first. Its purpose is to pump during a low inflow. Once the inflow rises above the jockey pump capacity and the second start level reaches, the normal pump will start and the jockey pump will stop

S – **Storm -** usually a pump larger than **N**ormal pumps, designed to work only in case of an extreme high inflow (storm). If S=1 P3 is storm pump. The also can work together and with normal pumps depending on setting of **P-** number of pumps in parallel operation.

See table below for setting the desired operation

N	J	S	P	Operation description
3	0	0	3	All 3 pumps alternate; All 3 pumps can work together (in parallel)
3	0	0	2	All 3 pumps alternate; Only 2 pumps can work together (in parallel)
3	0	0	1	All 3 pumps alternate; Only 1 pump can run at the time (no parallel operation)
2	1	0	2	P1-jockey pump always starts first. P2,P3 alternate and both can work together (in parallel). P1 stops if the first of the normal pumps starts.
2	1	0	1	P1-jockey pump always starts first. P2, P3 alternate but only one of them can run at the time (no parallel operation). P1 stops if the normal pump starts.
2	0	1	3	P1, P2 normal pumps. They alternate. P3-storm pump All 3 pumps can work together (in parallel)
2	0	1	2	P1, P2 normal pumps. They alternate. P3-storm pump Only 2 normal pump can work together (in parallel). Normal pumps stop if P3 starts (START 3).
2	0	1	1	P1, P2 normal pumps. They alternate. P3-storm pump Only 1 normal pumps can run at the time (no parallel operation)). Normal pump stops if P3 starts (START 2).

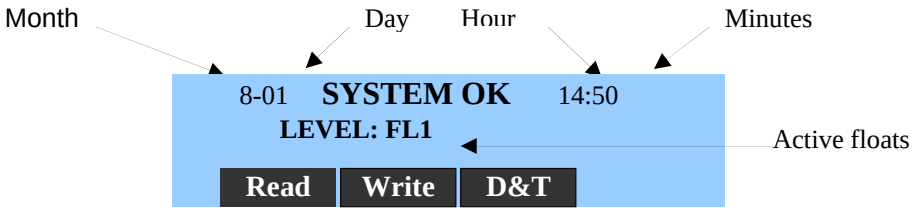
Note: Total number of pumps **N+J+S** can't be higher than 3. The system will reset to default setting (N=3.J=0, S=0, P=3) if during a setup the total 3 is exceeded.

3.3 Operator Interface Program

Using the operator interface, an operator can :

- read or change PLC current date & time
- read the parameters and data stored in the PLC data registers
- read the alarm register
- write the system operating parameters
- monitor the alarms
- reset all parameters to their default values (cold start)

If no alarm is active the following screen is displayed on the operator interface display:
:



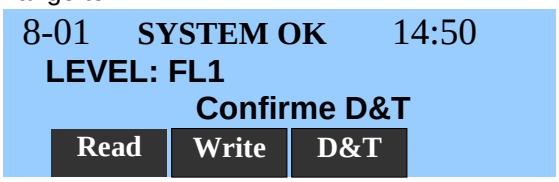
This is the default screen

The date (month - day) and the time (hour : minutes) stored in the CPU of PLC are displayed on the operator interface default screen.

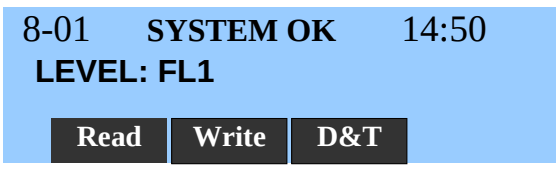
If these values do not correspond with reality, the operator can change it using operator interface key pad.

To change one of the displayed values (*month, day, hour, minutes*) an operator should :

- Push **D&T** function-key
- Screen change to



- Use ⇨⇦ arrow-keys to place the cursor on a value to change (coursor flashes on the value),
- Type the new value
- Push **ENTER**
- Push **D&T** to **confirm**
- Screen **return** to **default**



Repeat the procedure for each value to change

3.3.1 PARAMETERS TO READ ONLY

If no alarm is active, an operator can read the data stored in the specific data memory register by consecutively pushing **Read** function key. To read logged alarms push **Read** first and than **ALM** function key.

Parameters to read are given in the table 5 below:

TABLE 5. PLC DATA REGISTER READING

FUNCTION KEY of OPERATOR INTERFACE	PLC REGISTER	PARAMETER
Read	146, 143	Runtime P1 TOTAL
Read	176, 173	Runtime P1/ DAY
Read	155, 152	Runtime P2 TOTAL
Read	185, 182	Runtime P2 / DAY
Read	542, 539	Runtime P3 TOTAL
Read	578, 575	Runtime P3 / DAY
Read	164, 161	2P Runtime TOTAL
Read	194, 191	2P Runtime / DAY
Read	560, 557	3P Runtime TOTAL
Read	596, 593	3P Runtime / DAY
Read	217, 214	Overflow runtime
Read	202	No. of starts P1
Read	205	No. of starts P2
Read	608	No. of starts P3
Read	208	Hi level occurrences
Read	220	Overflow occurrences
Read than **ALM**	270	Alarm register

The **Read** function key allows reading all runtime totalizers and event counters. The daily time totalizers are cleared at Midnight.

Once displayed, each defined screen will be active during 60 seconds, if no key is pushed. After this period the default screen SYSTEM OK will be displayed. To return to default screen without delay (60 s) push **Back** key on the operator interface.

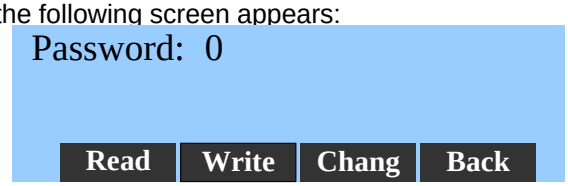
3.3.2 PARAMETERS TO READ AND WRITE

If the default screen is displayed (no alarm), an operator can read and write the control system parameters. To have access to these functions, the PASSWORD is required.
The read and write parameters are given in table 6 below.

TABLE 6. SYSTEM READ-WRITE PARAMETERS

FUNCTION KEY of OPERATOR INTERFACE	PLC REGISTER	PARAMETER	INITIAL VALUE	NOTES
Write	225	Language F - French E - English	E - English	
Write	102	New password	9	
Write	 2000 2001 2002 24	Number of pumps J-**J**ockey N-**N**ormal S-**S**torm P-in **P**arallel:	 0 3 0 3	CHOICE: 0.. 1 2.. 3 0.. 1 1-- 3
Write	2	Start 1 delay	10 s	
Write	5	Start 2 delay	10 s	
Write	613	Start 3 delay	10 s	
Write	616	Start 4 delay	10 s	
Write	8	Blocking delay P1	15 s	
Write	11	Blocking delay P2	15 s	
Write	619	Blocking delay P3	15 s	
Write	20	Alarm delay	5s	
Write	132	Contactor Closing Delay	9s	
Write	%M35	Alternating Mode	on	F2-ON F1-OFF

If **Write** function-key is pressed the following screen appears:

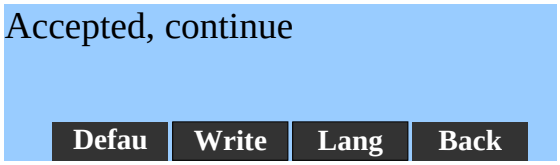


- Use ⇨⇦ arrow-keys to place the cursor on a digit 0 (Courser flashes on the value),

- Type the password using the numeric key-pad and press **ENTER** ↵ key.

The PASSWORD should be a number composed of 4 digits maximum.

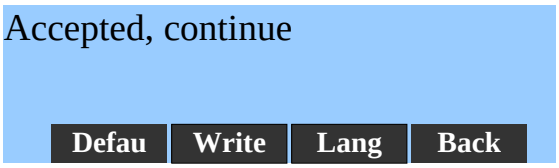
- If the password is correct the following message appears on the screen:



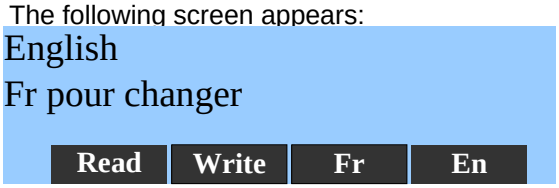
- Push the desired function-key
  - **Defau** to coldstart (default parameters)
  - **Write** to read or change another parameter
  - **Lang** to change display language
  - **Back** to return to default screen

LANGUAGE CHANGE

- On default screen push **Write** key and type password to get following screen:



- Push **Lang** on a that screen
- The following screen appears:



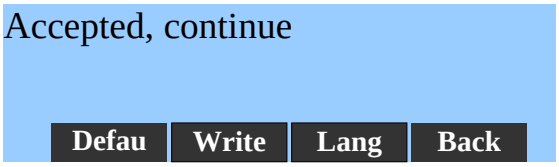
or

- Active language is displayed
- Push **Fr** to change to French or **En** to change to English
- Press **Write** to write another parameters

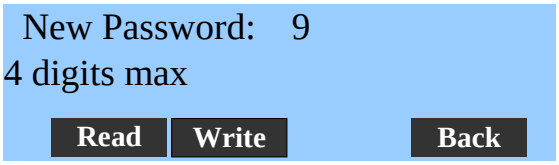
PASSWORD CHANGE:

- On default screen push **write**

- Type the password and push Enter



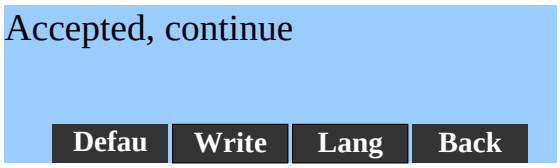
- Push PREV to return to previous screen
- Push **Chang**
- The following screen appears



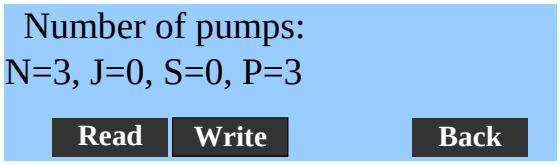
- Type your new password (composed of 4 digits max.)
- Press **ENTER**

NUMBER OF PUMPS CHANGE & TIME DELAYS CHANGE:

- On default screen push **Write** and type password to get following screen:



- Push **Write** function-key
- The following screen appears



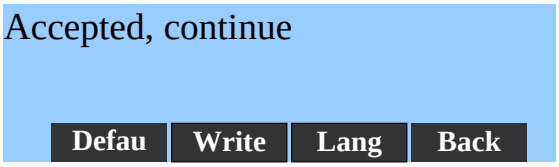
- Change number of pumps **N**ormal, **J**ockey, **S**torm, in **P**arallel to desired operation (see table in chapter 3.2 for details)
- Press **ENTER**
- Push **Write** to change or read another parameter or **Back** to return to default screen

- If you push **Write** the first DELAY screen appears:

- Use ⇨⇦ arrow-keys to place the cursor
- Type the new value
- Press **ENTER**
- Push **Write** function-key to read or write other delay
- Repeat four previous steps to change the time delay value
- Push **Write** to change or read another parameter or **Back** to return to default screen

ALTERNATION MODE DISABLE:

- On default screen push **Write** and type password to get following screen:



- Push **Write** function-key consecutively to get the screen

- Push **OFF** function-key to disable the alternate mode
- Push **Back** to return to default screen

Once displayed, each defined screen will be active during 60 seconds if no key is pushed. After this period the default screen will be displayed.

To return to default screen immediately push **Back** key on the operator interface

3.3.3 ALARM SCANNING

If one or more alarms described in the chapter 2.3.6 are activated the corresponding alarm-messages will appear on the screen of the operator interface, following the FAULT message. All displayed alarm messages are bilinguals. During the alarm's scanning, each screen is displayed for 2 seconds.

The list of alarm-messages is given in the table 7.

TABLE 7. ALARM- MESSAGES

MESSAGE	Notes
SURCHARGE P1 P1 OVERLOAD	or DEFAUT M1 M1 CLOSING FAULT
FUITE P1 LEAKAGE P1	
HAUTE TEMP. P1 P1 HIGH TEMP.	
SURCHARGE P2 P2 OVERLOAD	or DEFAUT M2 M2 CLOSING FAULT
FUITE P2 LEAKAGE P2	
HAUTE TEMP. P2 P2 HIGH TEMP.	
SURCHARGE P3 P3 OVERLOAD	or DEFAUT M3 M3 CLOSING FAULT
FUITE P3 LEAKAGE P3	
HAUTE TEMP. P3 P3 HIGH TEMP.	
HAUT NIVEAU HIGH LEV.	
PERTE DU RESEAU POWER FAILURE	
BAS NIVEAU LOW LEV.	
DEBORDEMENT OVERFLOW	
DEFAUT/FAULT	or URGENCE/EMERGENCY
FL1 Faute/Fails Fermet./closing	
FL2 Faute/Fails Fermet./closing	or ouvert./opening
FL3 Faute/Fails Fermet./closing	or ouvert./opening
FL4 Faute/Fails Fermet./closing	or ouvert./opening
FLH Faute/Fails Fermet./closing	or ouvert./opening

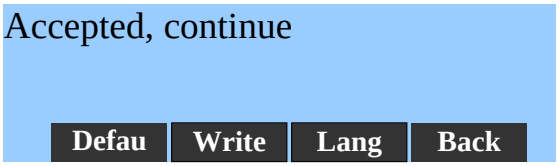
3.3.4 SYSTEM COLDSTART

During the coldstart the default values of all system parameters (see table 4 for details) are written to the specific data memory registers.

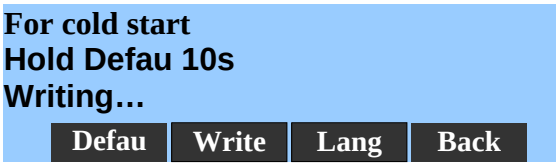
The coldstart is done automatically during the PLC program's first scan. An operator using the operator interface may also do it. ***COLDSTART:***

An operator using the operator interface can also do it.

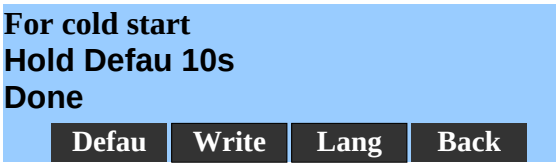
- On default screen push **Write** and type password to get following screen:



- Push and hold **Defau** function-key
- The following screen will appear



- After 10 s screen change to:



10-second delay is required for cold start to be effective. This action is also protected by PASSWORD.

3.3.5 ALARM'S REGISTER

Up to 16 alarms with date and time can be stored in PLC registers R300-R400 following the FIFO rule (first in-first out).
To CLEAR alarm's register an operator should push **Read** and than push and hold **ALM** function key during 10 seconds.

3.3.6 DISPLAY OF LOGGED ALARM'S REGISTER

To read alarm's register :

- On DEFAULT SCREEN push **Read** function key
- Push **ALM** function key
- first screen of the alarm's register appears giving the number of alarms since the last clearing

- Push **ALM** function key
- The most recent alarm appears with date :***month- day*** and**:** time: ***hour :minutes***

NOTE: The number of the alarms displayed on the first screen can be higher than 16, but only last 16 alarms will stay in PLC memory.

4. APPENDICE 1

TABLE 1. ASSIGNATION OF FLOATS for LOGIMAC 330 sequence with 5 floats operation

faulty float (s)	**FUNCTION FLOAT 1**	**FUNCTION FLOAT 2**	**FUNCTION FLOAT 3**	**FUNCTION FLOAT 4**	**FUNCTION FLOAT H**	**INDICATION**
NONE	STOP (stops three pumps)	START 1 (starts first pump)	START 2 (starts second pump)	START 3 (starts third pump)	HIGH LEVEL alarm	**NONE** or EMERGENCY if FLH active
FLOAT 1	OUT OF ORDER	STOP (stops three pumps)	START 1 (starts first pump)	START 2 (starts second pump)	HIGH LEVEL alarm & START 3 (starts third pump)	**FAULT** or EMERGENCY if FLH active
FLOAT 2	STOP (stops three pumps)	OUT OF ORDER	START 1 (starts first pump)	START 2 (starts second pump)	HIGH LEVEL alarm & START 3 (starts third pump)	**FAULT** or EMERGENCY if FLH active
FLOAT 3	STOP (stops three pumps)	START 1 (starts first pump)	OUT OF ORDER	START 2 (starts second pump)	HIGH LEVEL alarm & START 3 (starts third pump)	**FAULT** or EMERGENCY if FLH active
FLOAT 4	STOP (stops three pumps)	START 1 (starts first pump)	START 2 (starts second pump)	OUT OF ORDER	HIGH LEVEL alarm & START 3 (starts third pump)	**FAULT** or EMERGENCY if FLH active
FLOAT H	STOP (stops three pumps)	START 1 (starts first pump)	START 2 (starts second pump)	START 3 (starts third pump)	OUT OF ORDER	**EMERGENCY**
FLOATS 1 & 2	OUT OF ORDER	OUT OF ORDER	STOP (stops three pumps)	START 1 (starts first pump)	HIGH LEVEL alarm & START 2&3 (starts two pumps)	**FAULT** or EMERGENCY if FLH active
FLOATS 1 & 3	OUT OF ORDER	STOP (stops three pumps)	OUT OF ORDER	START 1 (starts first pump)	HIGH LEVEL alarm & START 2&3 (starts two pumps)	**FAULT** or EMERGENCY if FLH active
FLOATS 1 & 4	OUT OF ORDER	STOP (stops three pumps)	START 1 (starts first pump)	OUT OF ORDER	HIGH LEVEL alarm & START 2&3 (starts two pumps)	**FAULT** or EMERGENCY if FLH active
FLOATS 1 & H	OUT OF ORDER	STOP (stops three pumps)	START 1 (starts first pump)	START 2& 3 (starts two pumps)	OUT OF ORDER	**EMERGENCY**
FLOATS 2 & 3	STOP (stops three pumps)	OUT OF ORDER	OUT OF ORDER	START 1 (starts first pump)	HIGH LEVEL alarm & START 2&3 (starts two pumps)	**FAULT** or EMERGENCY if FLH active
FLOATS 2 & 4	STOP (stops three pumps)	OUT OF ORDER	START 1 (starts first pump)	OUT OF ORDER	HIGH LEVEL alarm & START 2&3 (starts two pumps)	**FAULT** or EMERGENCY if FLH active
FLOATS 2 & H	STOP (stops three pumps)	OUT OF ORDER	START 1 (starts first pump)	START 2& 3 (starts two pumps)	OUT OF ORDER	**EMERGENCY**
FLOATS 3 & 4	STOP (stops three pumps)	START 1 (starts first pump)	OUT OF ORDER	OUT OF ORDER	START 2& 3 (starts two pumps)	**FAULT** or EMERGENCY if FLH active
FLOATS 3 & H	STOP (stops three pumps)	START 1 (starts first pump)	OUT OF ORDER	START 2& 3 (starts two pumps)	OUT OF ORDER	**EMERGENCY**
FLOATS 4 & H	STOP (stops three pumps)	START 1 (starts first pump)	START 2& 3 (starts two pumps)	OUT OF ORDER	OUT OF ORDER	**EMERGENCY**
FLOATS 1,2 & 3	OUT OF ORDER	OUT OF ORDER	OUT OF ORDER	STOP (stops three pumps)	HIGH LEVEL alarm & START 1,2&3 (starts three pumps)	**FAULT** or EMERGENCY if FLH active
FLOATS 1,2 & 4	OUT OF ORDER	OUT OF ORDER	STOP (stops three pumps)	OUT OF ORDER	HIGH LEVEL alarm & START 1,2&3 (starts three pumps)	**FAULT** or EMERGENCY if FLH active
FLOATS 1,2 & H	OUT OF ORDER	OUT OF ORDER	STOP (stops three pumps)	START 1,2&3 (starts three pumps)	OUT OF ORDER	**EMERGENCY**
FLOATS	OUT OF ORDER	STOP	OUT OF ORDER	OUT OF ORDER	HIGH LEVEL alarm &	**FAULT** or

1,3 & 4		(stops three pumps)			START 1,2&3 (starts three pumps)	EMERGENCY if FLH active
faulty float (s)	**FUNCTION FLOAT 1**	**FUNCTION FLOAT 2**	**FUNCTION FLOAT 3**	**FUNCTION FLOAT 4**	**FUNCTION FLOAT H**	**INDICATION**
FLOATS 1,3 & H	OUT OF ORDER	STOP (stops three pumps)	OUT OF ORDER	START 1,2&3 (starts three pumps)	OUT OF ORDER	**EMERGENCY**
FLOATS 1,4 & H	OUT OF ORDER	STOP (stops three pumps)	START 1,2&3 (starts three pumps)	OUT OF ORDER	OUT OF ORDER	**EMERGENCY**
FLOATS 2,3& 4	STOP (stops three pumps)	OUT OF ORDER	OUT OF ORDER	OUT OF ORDER	HIGH LEVEL alarm & START 1,2&3 (starts three pumps)	**FAULT** or EMERGENCY if FLH active
FLOATS 2,3& H	STOP (stops three pumps)	OUT OF ORDER	OUT OF ORDER	START 1,2&3 (starts three pumps)	OUT OF ORDER	**EMERGENCY**
FLOATS 3,4& H	STOP (stops three pumps)	START 1,2&3 (starts three pumps)	OUT OF ORDER	OUT OF ORDER	OUT OF ORDER	**EMERGENCY**
4 FLOATS or MORE	THREE PUMPS START AND KEEP RUNNING UNTIL FAULT CORRECTION					**EMERGENCY**

TABLE 2. ASSIGNATION OF FLOATS for LOGIMAC 330 sequence with 4 floats operation

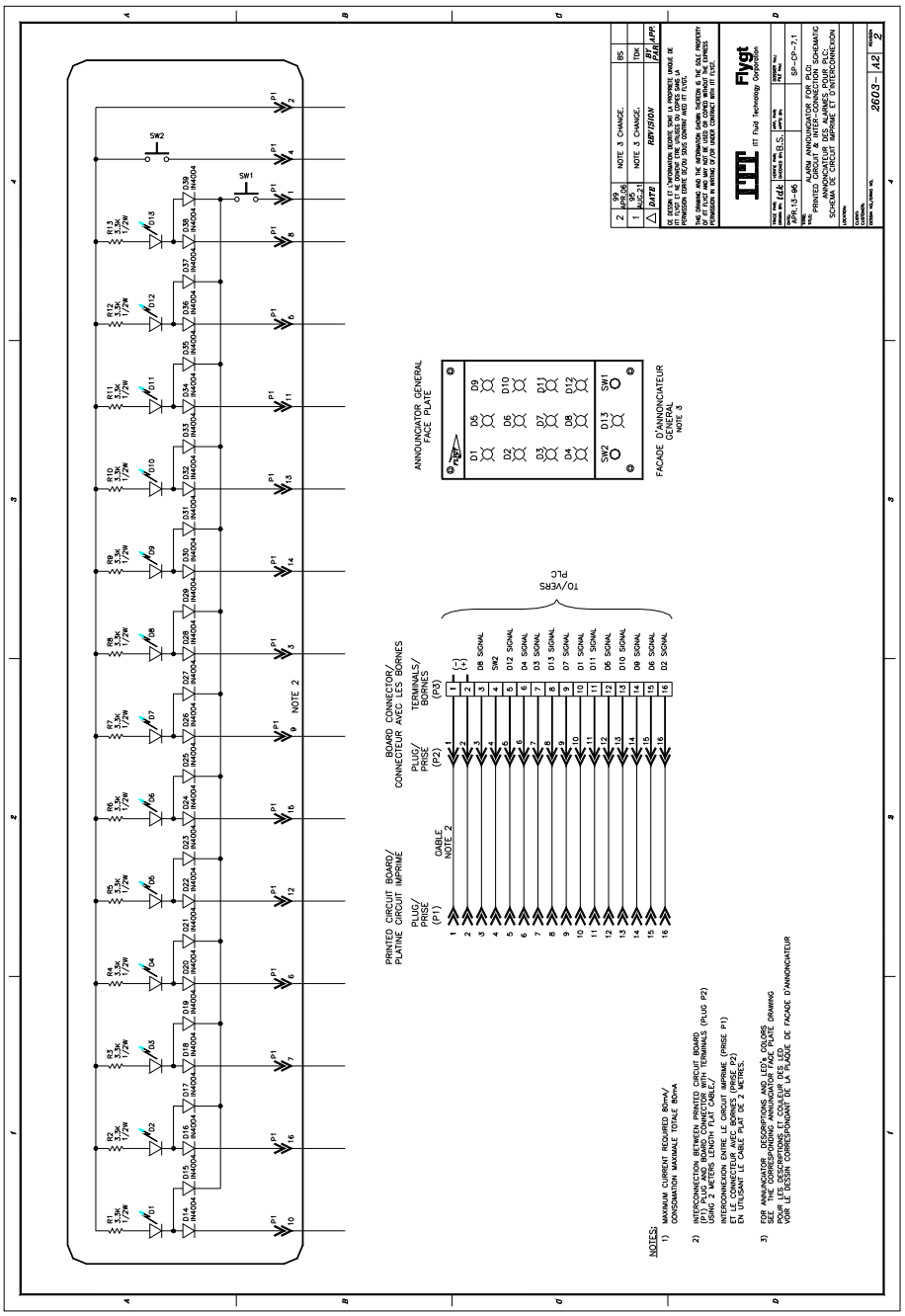
faulty float (s)	**FUNCTION FLOAT 1**	**FUNCTION FLOAT 2**	**FUNCTION FLOAT 3**	**FUNCTION FLOAT H**	**INDICATION**
NONE	STOP (stops two pumps)	START 1 (starts first pump)	START 2 (starts second pump)	HIGH LEVEL alarm	**NONE** or EMERGENCY if FLH active
FLOAT 1	OUT OF ORDER	STOP (stops two pumps)	START 1 (starts first pump)	HIGH LEVEL alarm & START 2 (starts second pump)	**FAULT** or EMERGENCY if FLH active
FLOAT 2	STOP (stops two pumps)	OUT OF ORDER	START 1 (starts first pump)	HIGH LEVEL alarm & START 2 (starts second pump)	**FAULT** or EMERGENCY if FLH active
FLOAT 3	STOP (stops two pumps)	START 1 (starts first pump)	OUT OF ORDER	HIGH LEVEL alarm & START 2 (starts second pump)	**FAULT** or EMERGENCY if FLH active
FLOAT H	STOP (stops two pumps)	START 1 (starts first pump)	START 2 (starts second pump)	OUT OF ORDER	**EMERGENCY**
FLOATS 1 & 2	OUT OF ORDER	OUT OF ORDER	STOP (stops two pumps)	HIGH LEVEL alarm & START1&2 (starts two pumps)	**FAULT** or EMERGENCY if FLH active
FLOATS 1 & 3	OUT OF ORDER	STOP (stops two pumps)	OUT OF ORDER	HIGH LEVEL alarm & START1&2 (starts two pumps)	**FAULT** or EMERGENCY if FLH active
FLOATS 1 & H	OUT OF ORDER	STOP (stops two pumps)	START 1& 2 (starts two pumps)	OUT OF ORDER	**EMERGENCY**
FLOATS 2 & 3	STOP (stops two pumps)	OUT OF ORDER	OUT OF ORDER	HIGH LEVEL alarm & START1&2 (starts two pumps)	**FAULT** or EMERGENCY if FLH active
FLOATS 2 & H	STOP (stops two pumps)	OUT OF ORDER	START 1& 2 (starts two pumps)	OUT OF ORDER	**EMERGENCY**
FLOATS 3 ET H	STOP (stops two pumps)	START 1& 2 (starts two pumps)	OUT OF ORDER	OUT OF ORDER	**EMERGENCY**
3 FLOATS or MORE	TWO PUMPS START AND KEEP RUNNING UNTIL FAULT CORRECTION				**EMERGENCY**

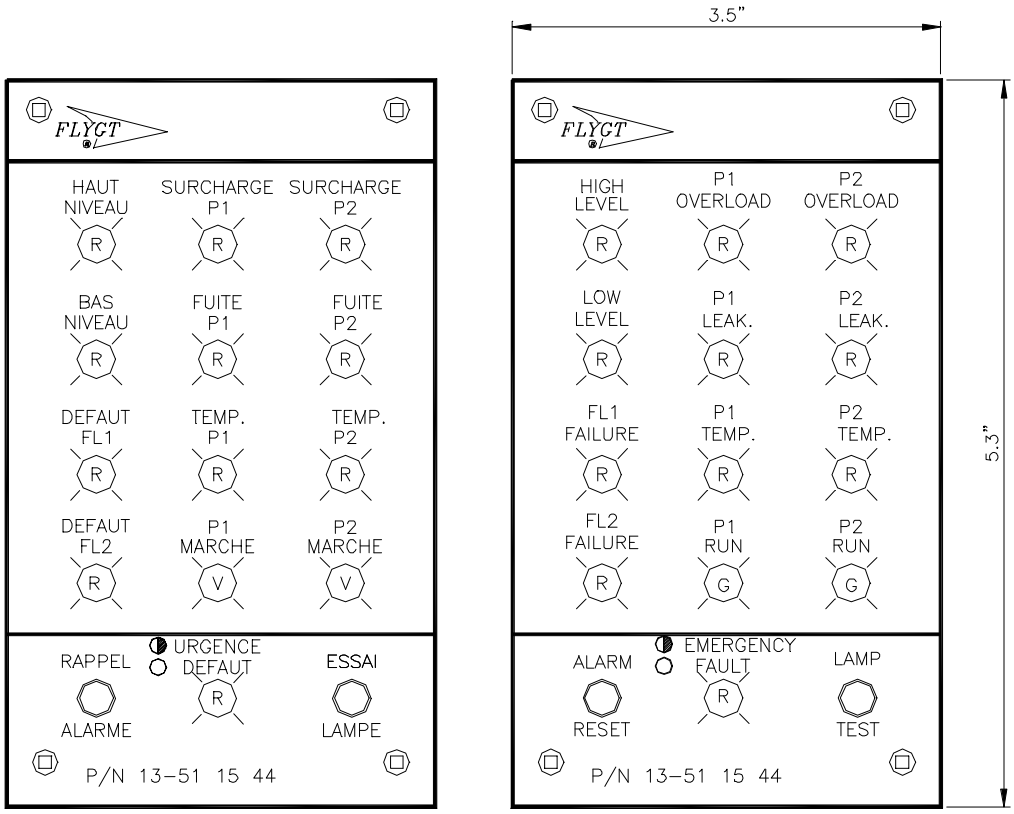
APPENDICE 2

List of attached drawings:

1. Drawing # 2603-A2 : Alarm annunciator, printed circuit and interconnection schematic

2. Drawing # C-51 15 44: LOGIMAC® 440-AP1 Alarm annunciator, face plate with descriptions
3. Drawing # C-51 15 45: LOGIMAC® 440-AP2 Alarm annunciator, face plate with descriptions
4. Drawing # L330 I/O : LOGIMAC 330 INPUT/OUTPUT CONNECTION


NOTES:
1) MAXIMUM CURRENT REQUIRED 80mA/
CONSOMMATION MAXIMALE TOTALE 80mA
2) INTERCONNECTION BETWEEN PRINTED CIRCUIT BOARD
AND CONNECTOR BOARD (PLUG P2) WITH TERMINALS
USING 2 METERS LENGTH FLAT CABLE.
INTERCONNEXION ENTRE LE CIRCUIT IMPRIME (PRISE P1)
ET LE CONNECTEUR AVEC BORNES (PRISE P2)
EN UTILISANT LE PLAT DE 2 METRES.
3) FOR ANNUNCIATOR DESCRIPTIONS AND LED'S COLORS
SEE THE CORRESPONDING ANNUNCIATOR FACE PLATE DRAWING
POUR LES DESCRIPTIONS ET COULEUR DES LED
VOIR LE DESSIN CORRESPONDANT DE LA FACADE DE L'ANNONCIATEUR
PRINTED CIRCUIT BOARD/
PLATINE CIRCUIT IMPRIME
CABLE
NOTE 2
BOARD CONNECTOR/
CONNECTEUR AVEC LES BORNES
PLUG/
PRISE
(P2)
TERMINALS/
BORNES
(P3)
TO/VERS
PLC
D1 SIGNAL
D2 SIGNAL
D3 SIGNAL
D4 SIGNAL
D5 SIGNAL
D6 SIGNAL
D7 SIGNAL
D8 SIGNAL
D9 SIGNAL
D10 SIGNAL
D11 SIGNAL
D12 SIGNAL
D13 SIGNAL
SW1
SW2
NOTE 2
ANNUNCIATOR GENERAL
FACE PLATE
FACADE D'ANNONCIATEUR
GENERAL
NOTE 3
NOTE 3 CHANGE.
NOTE 3 CHANGE.
REVISION
ITT Flygt Technology Corporation
ALARM ANNUNCIATOR FOR PLC
ANNONCIATEUR D'ALARME POUR API
PRINTED CIRCUIT BOARD SCHEMATIC
SCHEMA DE CIRCUIT IMPRIME ET D'INTERCONNEXION
2603-
SP-CP-7.1



USED WITH P/N 13-41 00 15
13-42 00 03
13-50 90 07
13-50 90 36

TITRE/TITLE

PLAQUE D'ANNONCIATEUR REVERSIBLE AVEC LES DESCRIPTIONS (LOGIMAC 440-AP1)

REVERSIBLE ANNUNCIATOR PLATE WITH DESCRIPTIONS (LOGIMAC 440-AP1)

DESCRIPTION: REVERSIBLE ANNUNCIATOR PLATE WITH DESCRIPTIONS (LOGIMAC 440-AP1). WHITE LETTERING ON A BLACK BACKGROUND.

VERIF./CHK'D. :

APPR.

INITIAL APPLICATION PREMIERE : SP-DP-1.1

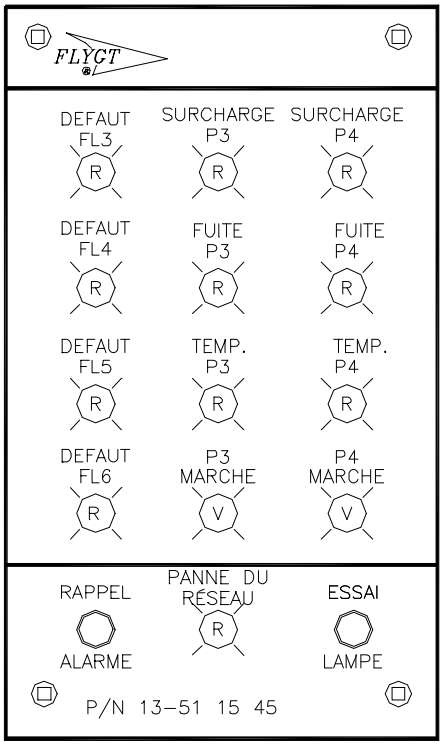
FOURNISSEUR/ SUPPLIER

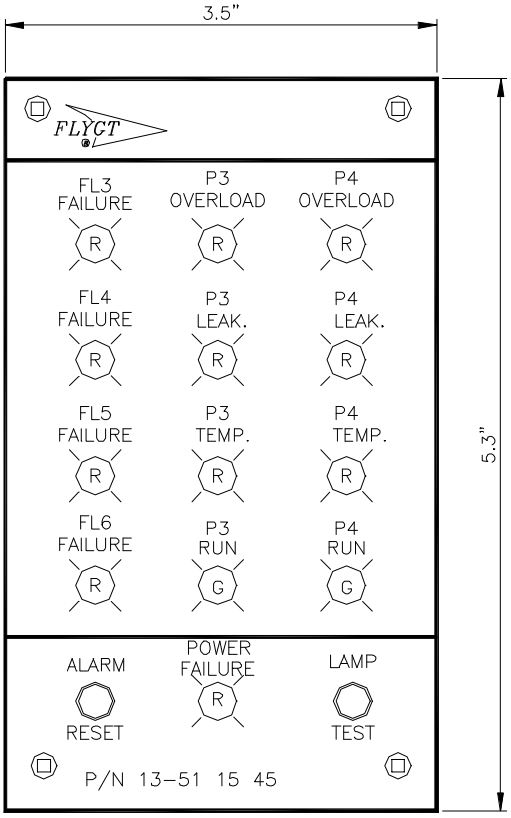
DATE 97-07-16

△	DATE	REVISION	BY PAR APP.

FLYGT N/P : P/N : C-51 15 44

REV. 0





USED WITH P/N 13-41 00 15
13-42 00 03
13-50 90 07
13-50 90 36

TITRE/TITLE

PLAQUE D'ANNONCIATEUR REVERSIBLE AVEC LES DESCRIPTIONS (LOGIMAC 440-AP2)

REVERSIBLE ANNUNCIATOR PLATE WITH DESCRIPTIONS (LOGIMAC 440-AP2)

DESCRIPTION: REVERSIBLE ANNUNCIATOR PLATE WITH DESCRIPTIONS (LOGIMAC 440-AP2). WHITE LETTERING ON A BLACK BACKGROUND.

VERIF./CHK'D. :

APPR.

INITIAL APPLICATION PREMIERE : SP-DP-1.1

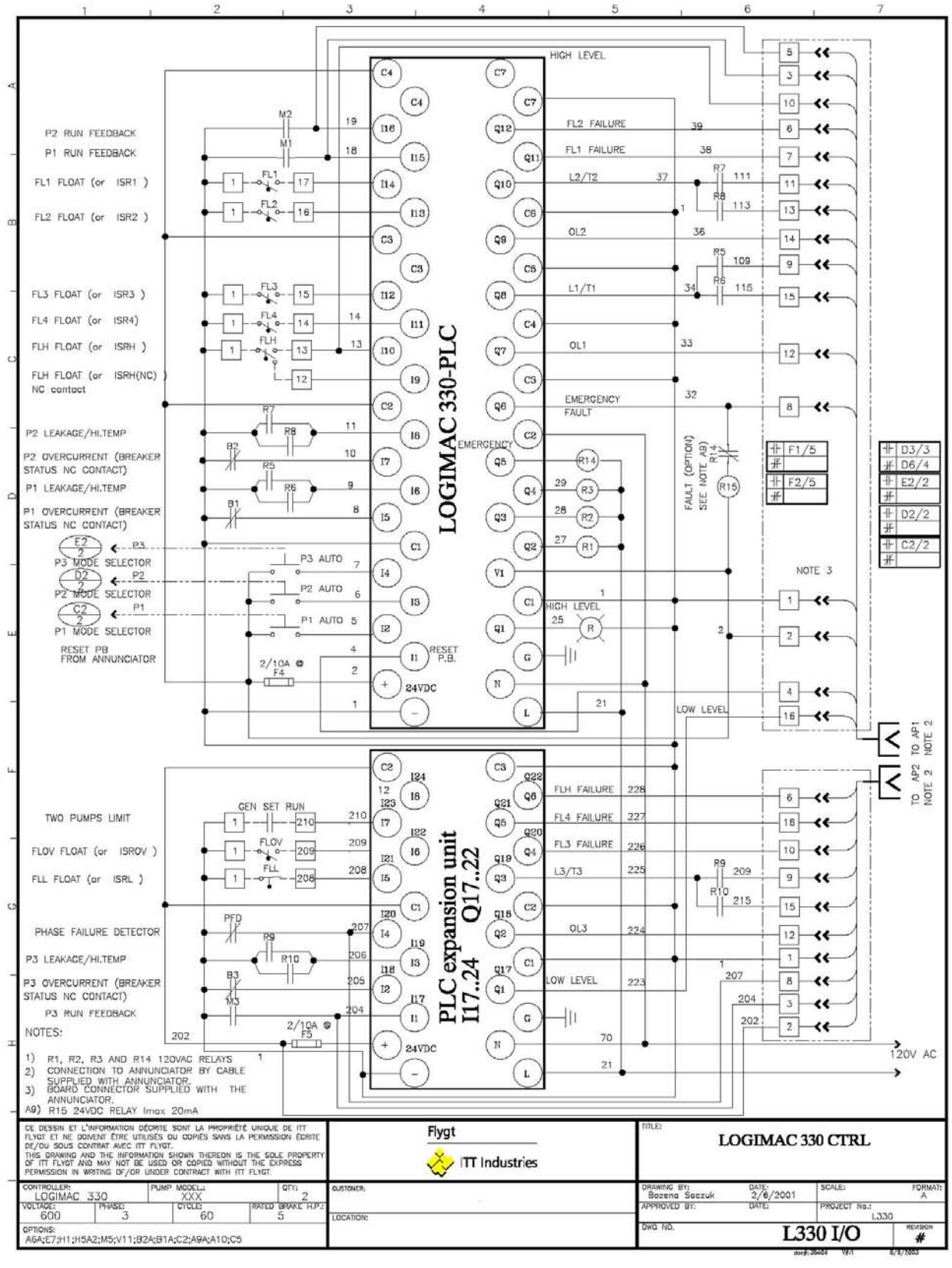
FOURNISSEUR/ SUPPLIER

DATE 97-07-16

△	DATE	REVISION	BY PAR APP.

FLYGT N/P : P/N : C-51 15 45

REV. 0


LOGIMAC 330-PLC
PLC expansion unit I17..24 Q17..22
HIGH LEVEL
FL2 FAILURE
FL1 FAILURE
L2/T2
OL2
L1/T1
OL1
EMERGENCY FAULT
LOW LEVEL
FLH FAILURE
FL4 FAILURE
FL3 FAILURE
L3/T3
OL3
P2 RUN FEEDBACK
P1 RUN FEEDBACK
FL1 FLOAT (or ISR1)
FL2 FLOAT (or ISR2)
FL3 FLOAT (or ISR3)
FL4 FLOAT (or ISR4)
FLH FLOAT (or ISRH)
FLH FLOAT (or ISRH(NC)) NC contact
P2 LEAKAGE/HI.TEMP
P2 OVERCURRENT (BREAKER STATUS NC CONTACT)
P1 LEAKAGE/HI.TEMP
P1 OVERCURRENT (BREAKER STATUS NC CONTACT)
P3 MODE SELECTOR
P2 MODE SELECTOR
P1 MODE SELECTOR
RESET PB FROM ANNUNCIATOR
TWO PUMPS LIMIT
FLOV FLOAT (or ISROV)
FLL FLOAT (or ISRL)
PHASE FAILURE DETECTOR
P3 LEAKAGE/HI.TEMP
P3 OVERCURRENT (BREAKER STATUS NC CONTACT)
P3 RUN FEEDBACK
NOTES:
1) R1, R2, R3 AND R14 120VAC RELAYS
2) CONNECTION TO ANNUNCIATOR BY CABLE SUPPLIED WITH ANNUNCIATOR.
3) BOARD CONNECTOR SUPPLIED WITH THE ANNUNCIATOR.
A9) R15 24VDC RELAY Imax 20mA
NOTE 3
120V AC
TO AP1 NOTE 2
TO AP2 NOTE 2
LOGIMAC 330 CTRL
L330 I/O
Flygt
ITT Industries

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